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A Late Bronze Age II Cist Grave at Tel Qana in the Sharon Coastal Plain

Edwin C.M. van den Brink

Tel Qana (Tell el-Mukhmar) is situated in the Naḥal Ha-Yarqon basin, slightly north of the point where Naḥal Qana drains into Naḥal Yarqon, 3 km east of Ramat Ha-Sharon, 5 km south of Raʿanana and 4.5 km northwest of Tel Afeq, which has contemporaneous layers (map ref. 189793–961/670624–749; Fig. 1). The mound rises c. 12 m above the surrounding plain and its visible remains cover an area of 25 dunams (Fig. 2). Gophna and Ayalon surveyed the site in the late 1970s (1998:40*, Site 97). Surface finds collected during this survey include potsherds from the Early, Middle and Late Bronze Ages and the Iron Age I–II, as well as the Persian, Roman and Byzantine periods (Gophna and Ayalon 1998: Figs. 97.1–10).

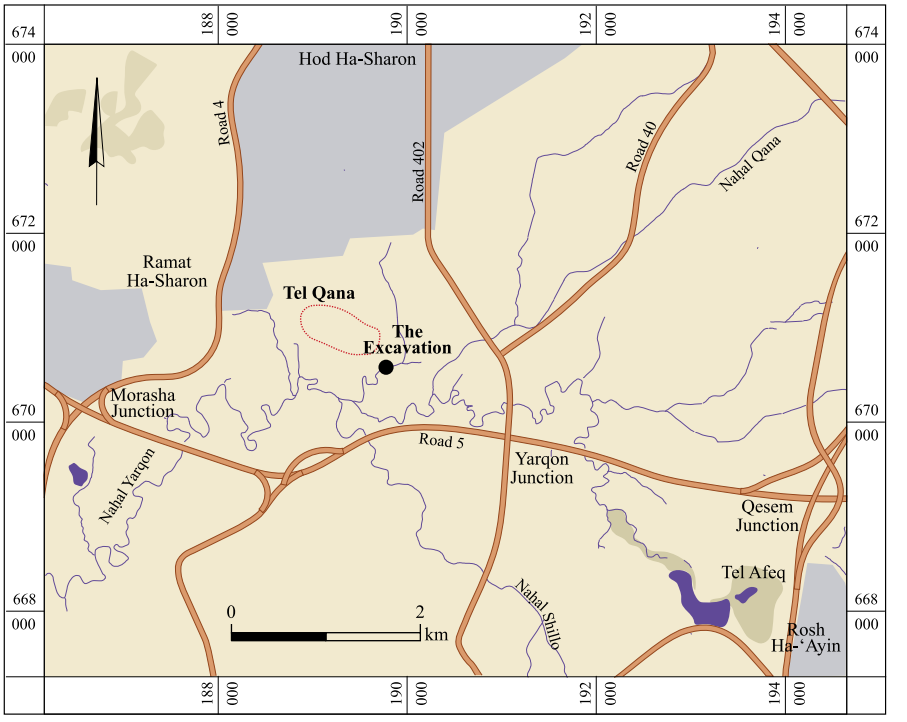


Fig. 1. Location map.

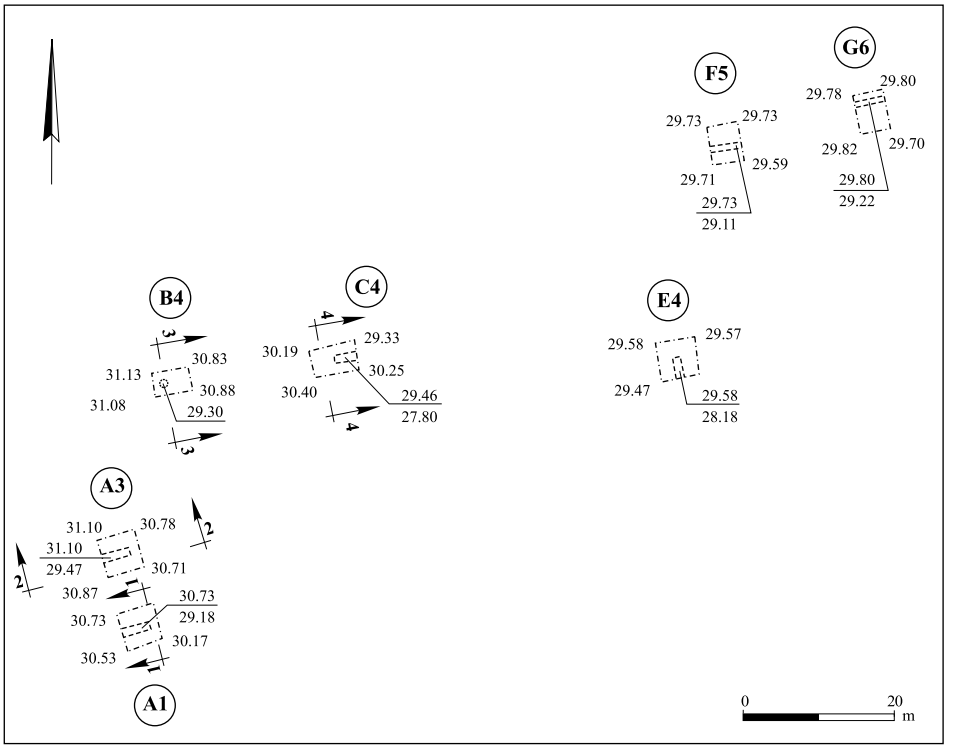
Fig. 2. Tel Qana, general view of the excavation area looking west.

Excavations at the site were carried out between June 24 and July 5, 2007.[1] Prior to these excavations, an agricultural plot located 5–25 m east of the tell's margins was trenched mechanically under the inspection of Durar Masarwa (of the IAA) in anticipation of land development for recreational purposes. This trenching revealed eleven potential archaeological features. It also showed clearly, as did the subsequent salvage excavation, that topsoil deposits of mixed alluvial and colluvial sediments thickened toward the eastern margins of the tell. The alluvial sediments were most likely deposited in the past by the meandering of Naḥal Qana and its tributary Naḥal Hadar, still flowing today to the east and south of the site, respectively. Slightly farther to the east, away from the fringes of the tell, the alluvial sediments become thinner and the underlying *ḥamra* soils become more prominent. Apparently, there was once a depression between the eastern margins of the tell and the *ḥamra* hillock to its east. These two relics of the paleo-landscape now lie under heavy alluvial soil and are no longer visible today.

THE EXCAVATION

Eleven squares were opened across the field. Of these, seven 4 × 4 m squares distributed over an area of c. 50 × 120 m were manually excavated in the northern half of the field: four were located in its west (Sqs A1, A3, B4 and C4), closer to the tell, and three, in its

[1] The excavation at the site was carried out on behalf of the IAA (Permit No. A-5160) and financed by the Yarqon Park Authority. It was directed by the author with the assistance of the late Shlomo Ya'aqov-Jam and Eli Bachar (administration), Avraham Hajian, Tania Meltzen, Rivka Mishayev and Natalia Zak (surveying and drafting), Elena Ilana Delerzon (location map), Tsila Sagiv (field photography), Clara Amit (studio photography), Carmen Hersch (drawings) and Yossi Nagar (physical anthropology). The author would like to thank Rivka Gonen for reading and commenting on an earlier draft of this report, and Eitan Ayalon, for his help in the identification of the Iron Age II winepresses as such.



Plan 1. The excavation.

east (Sqs E4, F5 and G6), farther away from the tell (Plan 1). A distinct difference in subsoil was noted between the thick layers of alluvial sediments in the eastern squares and the *ḥamra* soils in the western ones, which can be ascribed to structural differences in the paleo-landscape mentioned above.

A continuous living surface was encountered in all four western squares at an elevation of 0.6–0.8 m below the present surface (c. 16.00 m above sea level). It was indicated by a deposition of many flat-lying Middle Bronze Age II potsherds mixed with a few potsherds from the Iron Age and the Persian–Hellenistic periods. No other features were encountered in these squares except for an isolated *ṭabun* found protruding from the southern balk of Sq A3, c. 0.5 m below the living surface.

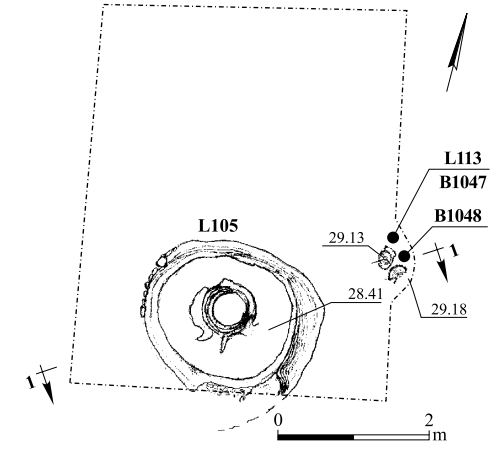
The accumulated soil sediments sealing the living surface were archaeologically sterile. The sediments below the living surface, excavated down to a maximum depth of c. 3 m, were nearly sterile, yielding only occasional potsherds that belong mainly to the MB II horizon and had probably filtered down. It seems that the distinct surface represents

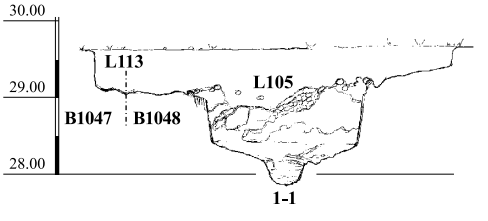
the original living surface east of the tell at the time of the MB II occupation of the site. The Middle Bronze Age occupation of the tell is evidenced, *inter alia*, by the abundant pottery collected in Gophna and Ayalon's survey (see above). The *ṭabun* was not associated with any datable material, but its stratigraphic position may indicate an occupation episode predating MB II.

The squares excavated in the east of the plot (Sqs E4, F5 and G6) were within the *ḥamra* hillock that had been covered by a layer of light brown, sterile alluvial and colluvial soils. As stated above, this topsoil layer was c. 1 m thick in the west (Sq E4) and only 0.2 m thick in the east (Sqs F5 and G6), identical in matrix to the soils that filled up the depression between the tell and the hillock.

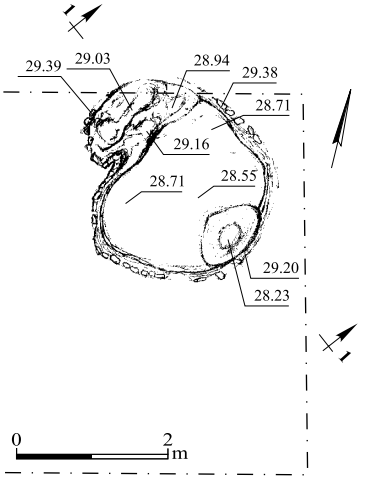
Remains of two circular plastered pits (L105 and L108) of a possible Iron II date (Plans 2, 3; Figs. 3, 4) were uncovered in two separate squares (Sqs F5 and G6), c. 5 m apart from each other. They are most likely winepress installations and have already been presented in some detail elsewhere (van den Brink 2007).

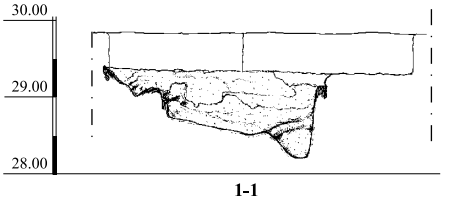
The present report focuses on a cist grave (L111) dating to Late Bronze Age II, exposed in Sq E4.





Plan 2. Square F5, L105, winepress.





Plan 3. Square G6, L108, winepress.

Fig. 3. Square F5, L105, winepress, looking west.

Fig. 4. Square G6, L108, winepress, looking south.

The Cist Grave

A rectangular east–west oriented pit (3.5 × 1.5 × 0.9 m; Plan 4; Fig. 5) was cut into the sterile *ḥamra* soil. Both its long walls and its short, western wall were lined with large limestones that had been carefully selected. Although their surfaces had not been worked, some of these stones are slab-like in appearance. The interior of the stone lining and the floor of the grave were coated with a layer of white plaster, several centimeters thick (see below).[2] The pit or cist must have originally been sealed by two or three large boulders or capstones, but these had been removed by the time of the excavation. One of these stones (measuring 1.2 × 0.8 × 0.3 m) was possibly found *ex situ*, resting on the southern edge of the pit. The remains of a single burial, apparently of a male individual,[3] were found deposited on the plastered floor of this cist. The deceased had been buried in an extended supine position, head in the west and feet to the east. Though found *in situ*, the bone remains were fragmentary and comprised skull fragments, a tooth and postcranial bones that were anatomically articulated, indicating a primary burial. The tooth was identified as a permanent upper incisor with minimal attrition (enamel facet only), indicative of an individual aged 15–25 years (Hillson 1986:176–201). A pelvic fragment showed a fused iliac crest, indicative of an individual aged ≥20 years (Johnston and Zimmer 1989). The individual's age is estimated, therefore, at 20–25 years.

The burial was accompanied by a number of ceramic and metal funerary gifts, which were all placed to the right of the deceased, against the southern wall of the grave.

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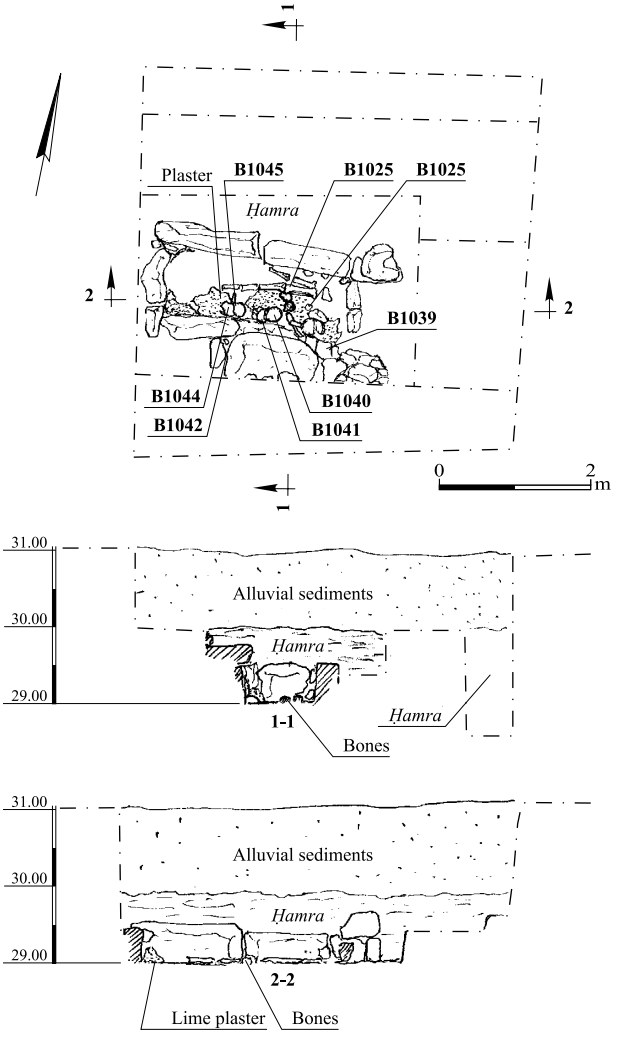
[2] The plaster was well-preserved on the floor, on parts of the interior of the stone lining along the southern wall and in the southwestern and northwestern corners of the cist. A sample was taken for petrographic analysis (see Tsatskin, below).

[3] The gender of the deceased could not be determined osteologically, but it seems probable that this was a male, based on the weaponry associated with the burial (see below). The information concerning the human bone remains was kindly provided by Yossi Nagar, who examined the skeleton remains in the field. After examination, the bones were reburied in the same spot in which they were found.



Plan 4. Square E4, L111, Late Bronze Age cist grave.

Fig. 5. Square E4, L111, the cist grave, looking west.

The Finds

The Pottery

The pottery assemblage includes two coil-built bowls with plain, flat bases (Fig. 6:1, 2), two oil lamps (Fig. 6:3, 4), two flasks (Fig. 6:5, 6) and a globular juglet (Fig. 6:7). The vessels are either wheel-made or wheel-finished. It seems that the flasks were made by joining two hemispheric bowls at their rims; the necks were then inserted and handles were attached to them.

All vessels have a plain, undecorated surface and appear to be of local production, their orange fabric possibly indicating the use of *ḥamra* soil as a component of the clay. While the absence of imported pottery vessels in the burial assemblage impedes determining a precise date within the fourteenth or thirteenth century BCE, the morphology of the local pottery is distinct enough to attribute the assemblage to a late phase of LB II. For example, the bowls illustrated in Fig. 6:1, 2 are characteristic of this period: their plain, flat-based form evolved from the disk-based bowls, which had gradually replaced the ring-based bowls typical of LB I. The oil lamps illustrated in Fig. 6:3, 4 are shallow, wheel-made bowls with one end pinched to form a nozzle. During the Late Bronze Age, the lamp nozzle became increasingly pronounced and more closely pinched (Gonen 1992b:236; Yannai 2000:59). This is demonstrated, for instance, by the early and later lamps uncovered in the LB I/II cemetery at Jatt, also situated in the Sharon plain, as illustrated in Yannai 2000: Fig. 4:56, 57 (LB I) vs. Fig. 11:128–130 (LB II). The latter compare well with the two lamps from Tel Qana.

The Metal Artifacts

The metal assemblage retrieved from the cist grave consists of two socketed spearheads, a tanged arrowhead and a disintegrated cylindrical object made of thin tin bronze foil (not illustrated)—possibly an ornament of a wooden walking stick (cf. Ben-Arieh and Edelstein 1977:31–32, Pl. 11:1–4). The socketed spearheads both have leaf-shaped blades: one pointed (Fig. 7:1) and the other rounded (Fig. 7:2). The base of one of the sockets (Fig. 7:1) has an embossed design consisting of two narrow, horizontal bands, each with a single row of a horizontal herringbone pattern enclosing a wider segment of six adjacent columns of vertical herringbone design (max. length 2.85 cm). The upper horizontal band is delineated by two plain continuous lines while the lower band has only a single (upper) border line. Both spear sockets have a hole near the base for attachment to the shaft (3.1 cm above the socket's orifice in Fig. 7:1; 3 cm above the socket's orifice in Fig. 7:2). The arrowhead with the leaf-shaped blade, cast in one piece, has a midrib and a tang that is rhomboid in section (Fig. 7:3). There is a clear cut between the stem and the tang.

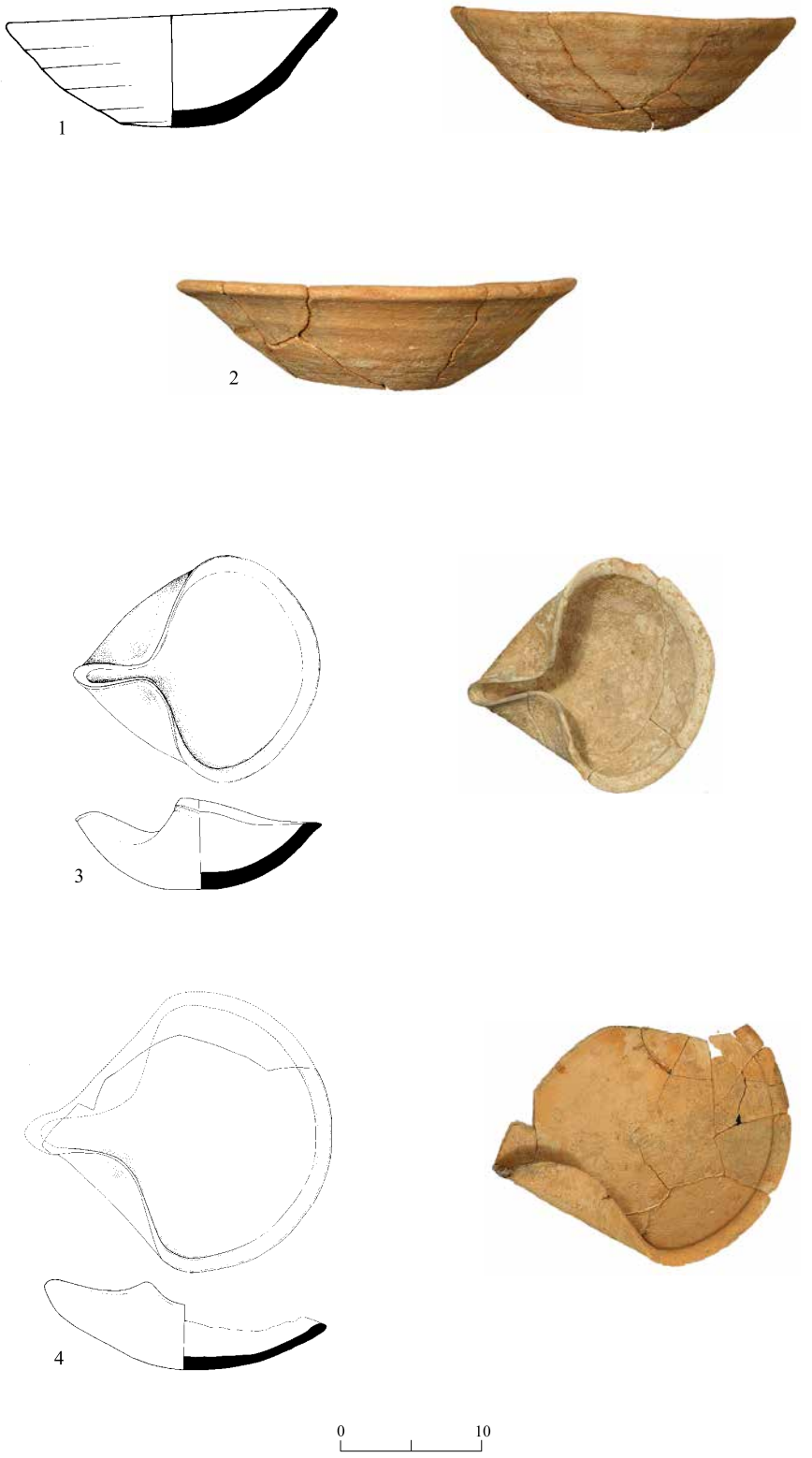


Fig. 6. Square E4, L111, pottery finds.

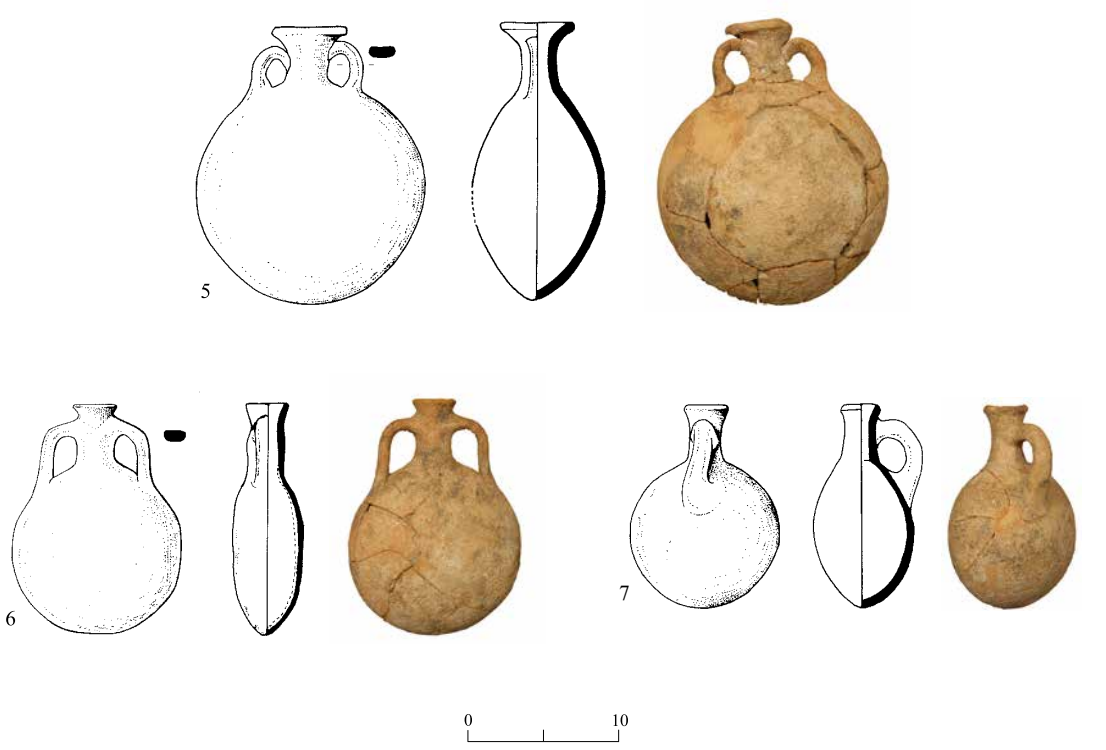


Fig. 6. (cont.)

No.	Vessel	Basket	Description	Parallels	Remarks
1	Bowl	1039	Coil built; outfolded rim; plain orange surface; white and few dark grits; medium-fired, smoothed int.; scraping marks and coils visible on ext.		Nearly complete; found with two metal spearheads adjacent to it
2	Bowl	1043	Coil built; central coil visible on bottom side of the flat base; rounded rim; plain orange surface; few black and white grits; buff orange core with orange oxidation zones; scrape marks and coils visible on ext.; smoothed int.		Found below lamp in B1042
3	Oil lamp	1028	Plain yellowish green surface; few white grits; traces of soot on ext. of nozzle; inner ledge of rim hardly visible	Jatt: Yannai 2000: Fig. 11:128, 129	Complete
4	Oil lamp	1042	Plain orange surface; few white grits; brown core with orange oxidation zones; soot on ext. of the nozzle; rim with inner ledge	Jatt: Yannai 2000: Fig. 11:130	Incomplete; found upside down
5	Flask	1040	Plain orange surface	Jatt: Yannai 2000: Fig. 11:123 (albeit without painted decoration)	Nearly complete
6	Flask	1041	Plain orange surface	Jatt: Yannai 2000: Fig. 11:125	Complete
7	Juglet	1044	Plain orange surface; white grits; medium fired		Nearly complete

XRF Analysis of the Metal Weapons
Sariel Shalev and Sana Shilstein

The three weapons found within the cist grave (Fig. 7) and fragments of a cylindrical object were studied in the archaeometallurgical laboratory at the Weizmann Institute of Science to analyze their chemical composition. The analysis was carried out using a prototype field XRF analyzer based upon a bench top model (EX-310LC, Jordan Valley, Israel) with an Rh X-ray tube and a Peltier cooled silicon PIN photodiode detector.

The green patina that covered the objects showed that all four were made of a copper-based metal. For analyzing the original metal content, we cleaned small spots on the objects' surfaces. The qualitative and quantitative results are presented in Table 1.

We used a high voltage of 35kV and a special filtering of the fluorescence radiation using a 0.24 mm thick pure aluminum filter on the detector window. This enabled us to distinguish elements such as tin, lead and arsenic. In these analytical conditions we used a primary beam with a 2 mm diameter. The sensitivity for tin and arsenic detection is about 0.02% weight and the relative accuracy necessary for determining the concentration of each element is about 10%.

Hundreds of metal artifacts were found in Late Bronze Age contexts in Israel, including over 200 blade weapons, 150 metal vessels, numerous working tools, small arrowheads and decorative objects. All the blades from this period that were analyzed (Shalev 2004) were found to be made of copper alloyed with tin, known as tin bronze. Most of the other copper-based objects were either made of similar tin bronze or contain different percentages of tin, and thus range from 'good' alloy to copper with tin impurities.

Large quantities of copper and tin ingots are found at sites along the Mediterranean coast and in shipwrecks, mainly off the southern coast of Turkey (Budd et al. 1995). The most outstanding find of this type was the discovery of ten tons of copper and three tons of tin

Table 1. XRF Analysis of Metal Artifacts from Grave L111

No.	Object	Basket	Analyzing Point	Major	Sn (wt%)	Pb (wt%)	As (wt%)	Comments
1	Spearhead (Fig. 7:2)	1025	Socket	Cu	24.0	0.2	1.2	Corrosion
			Blade	Cu	26.0	Traces[i]	0.9	Corrosion
2	Spearhead (Fig. 7:1)	1026	Socket	Cu	5.9	0.1	0.2	Corrosion
			Blade	Cu	11.1	0.3	0.8	
3	Arrowhead (Fig. 7:3)	1044	Tang	Cu	6.1	0.4	0.3	
			Blade	Cu	5.0	0.1	0.3	
4	Cylindrical object	1027		Cu	7.4	N.d.[ii]	0.01	Corrosion

[i] Refers to a concentration of 0.01% or lower.

[ii] N.d. = not detected.

ingots in a single cargo on the Uluburun shipwreck, dated to the fourteenth century BCE. During this time, Cypriot, Egyptian, Syrian and Mesopotamian types of tin-bronze objects were used in Canaan alongside the local repertoire (Gershuny 1985; Miron 1992; Shalev 2004). Prestige objects like sickle-blade swords or cast-hilt daggers were produced of high-quality tin bronze (copper with c. 11–13 wt% tin), whereas the simpler and probably less-valued objects present lower quantities of tin in the metal alloy (Shalev 1996).

The metal objects from Tel Qana presented in Table 1 fit well in the current overall archaeometallurgical picture for the Late Bronze Age: all four are made of a typical tin bronze. The two spearheads are made of a high-quality tin bronze of copper with c. 11 wt% tin. The high percentage of tin in spearhead No. 1 is ascribed to the tin-enriched corrosion

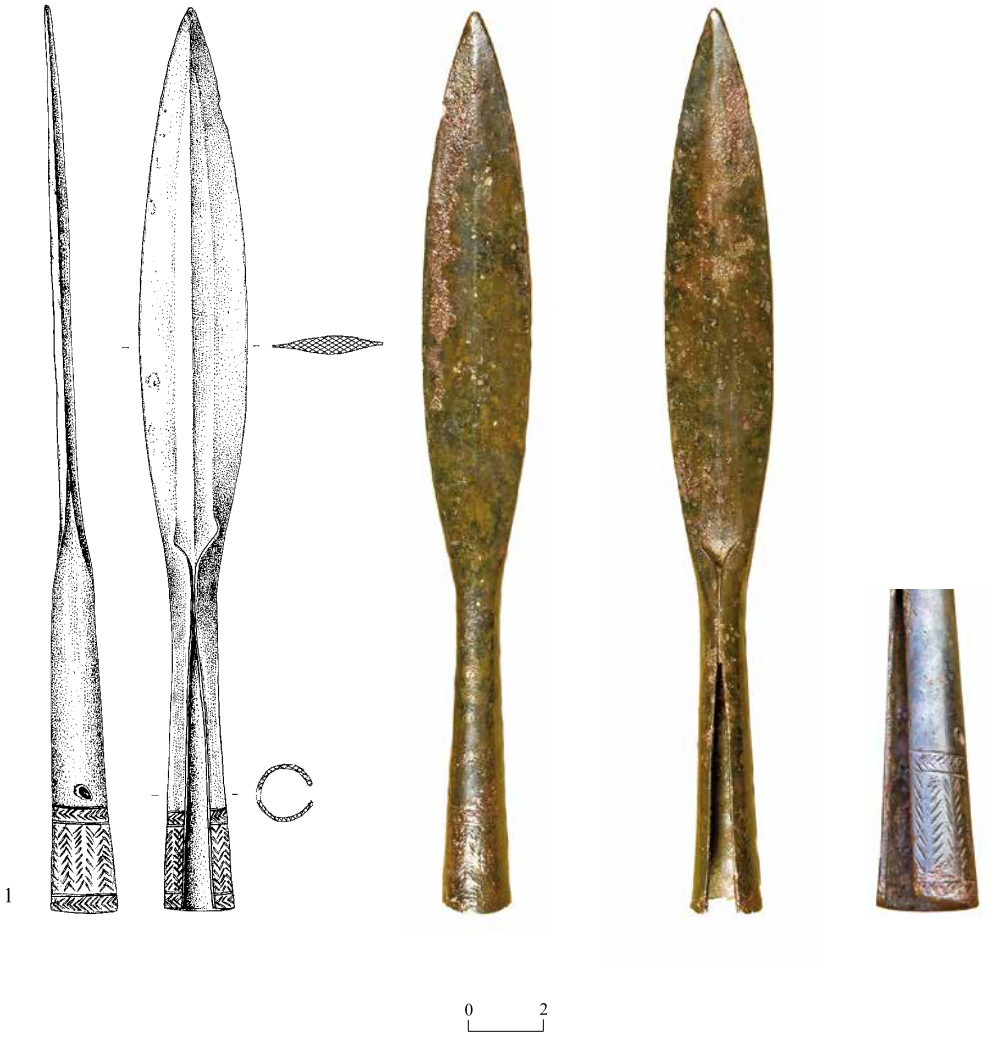


Fig. 7. Metal weapons from Sq E4, L111.

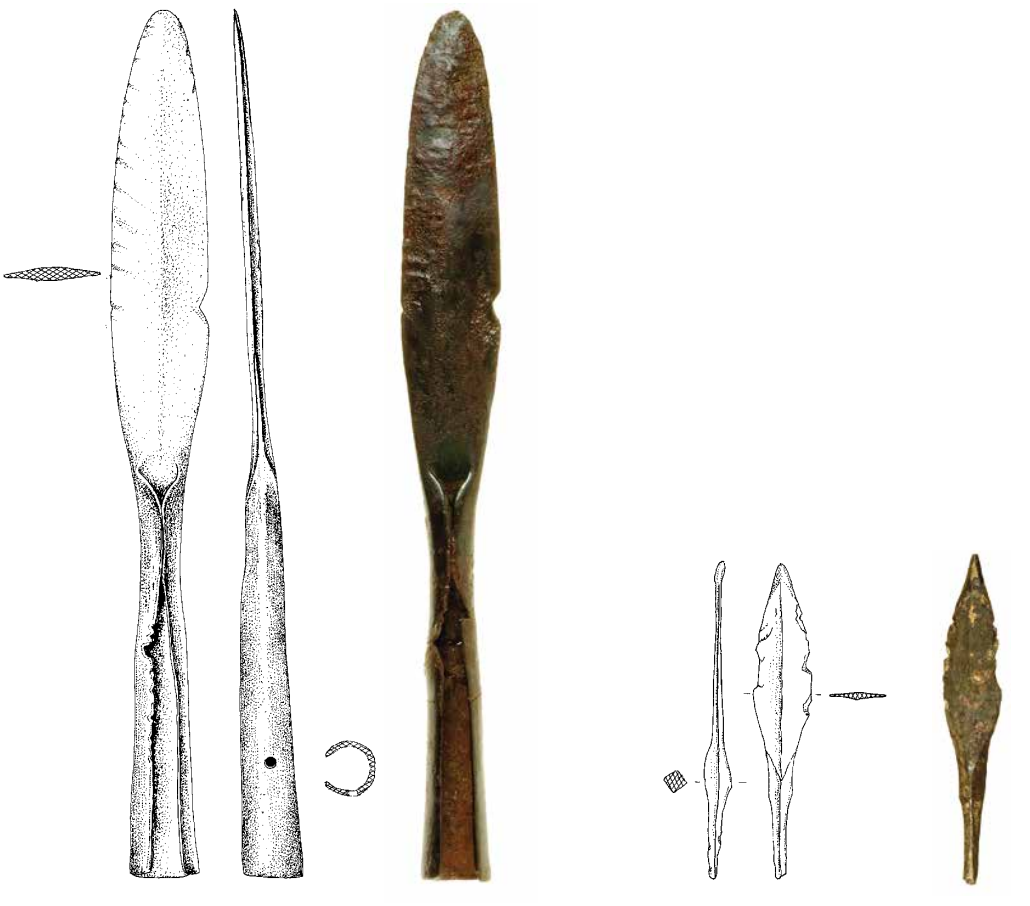


Fig. 7. (cont.)

No.	Type	Basket	Description	Dimensions (cm)
1	Spearhead	1026	Socketed, with embossed decoration around socket	24 (L) × 2.9 (max. width of blade) × 0.6 (max. blade thickness); max. diam. of socket: 1.85
2	Spearhead	1025	Plain, socketed	23 (L) × 2.5 (max. blade width) × 0.4 (max. blade thickness); max. diam. of socket: 1.65
3	Arrowhead	1044	Tanged	8.3 (L) × 1.65 (max. blade width) × 0.6 (max. blade thickness)

of the surface. There is a relatively small amount of tin in the socket of spearhead No. 2 that could indicate a phase with less tin in the socket area, which was intended to leave this area softer than the blade. Alternatively, this might reflect surface corrosion. Like other Late Bronze Age weapons, the arrowhead is made from tin bronze with a small amount of tin. Traces of arsenic are present in all three blade weapons, not exceeding the maximum of 1.2 wt%. The arsenic found in these objects is mainly a relic of older traditions from the Middle Bronze Age, when weapons were made either from tin bronze or from arsenical copper containing up to 5 wt% arsenic (Philip 1991; Shalev 2007). The traces of arsenic in the Late Bronze Age objects from Tel Qana are therefore not an indication of an alloy but, rather, impurities reflecting the production mode; at least part of the metal must have derived from older, scrapped objects that were remelted. In the thin foil fragments of the cylindrical object (Table 1:4) no solid metal is left and the analysis is of the corrosion product only. Therefore, the relative quantities measured do not necessarily reflect the original metal composition. Having said that, the amount of tin measured here shows that we are dealing with the same type of tin bronze as the three blade weapons.

Petrographic Examination of Plaster Samples

Alexander Tsatskin

Three plaster samples unearthed in Tel Qana were analyzed petrographically. Only one of them, deriving from the LB II cist grave (Sq E4, L111), is germane to the present study; the other two derive from the two possible Iron II winepresses mentioned above (Plans 2, 3; Figs. 3, 4). The goal of the petrographic study was to identify the composition and quality of the material, as well as secondary features associated with plausible deterioration. A petrographic thin section was prepared after the impregnation of the sample with polyester resin #442 under vacuum, slicing the oriented impregnated block vertically and polishing a slide to a thickness of 0.03 mm. The thin section was examined under an Olympus BH2 polarizing light microscope. Petrographic descriptions follow Kempe and Harvey (1983), Bullock et al. (1985), Gibson and Woods (1990), Goren and Goldberg (1991) and Vandiver et al. (1992).

The top–down oriented sample of the plaster covering the interior of the LB II cist grave consists of a c. 1.8 cm thick bulk layer of whitish plaster with a gray-brown burnished surface. The lowermost layer appears to represent a rock to which the plaster sample was fixed. In thin section the bulk plaster layer comprises dense, compacted lime mortar with additions of silt- and sand-sized quartz; the bulk layer is sandwiched between the two layers of clay material mixed with lime. The clay layers are relatively thin, c. 0.2–0.5 mm, and they differ in that the upper one is mostly calcareous (Fig. 8), while the lower one is mostly clayey (Fig. 9).

Although the fabric of the bulk layer is quite homogeneous, there are two features of some disturbances, i.e., a c. 1 mm thick lens composed of silt and clay and an elongated fissure parallel to the surface, filled with secondary calcite crystallites (not shown in the

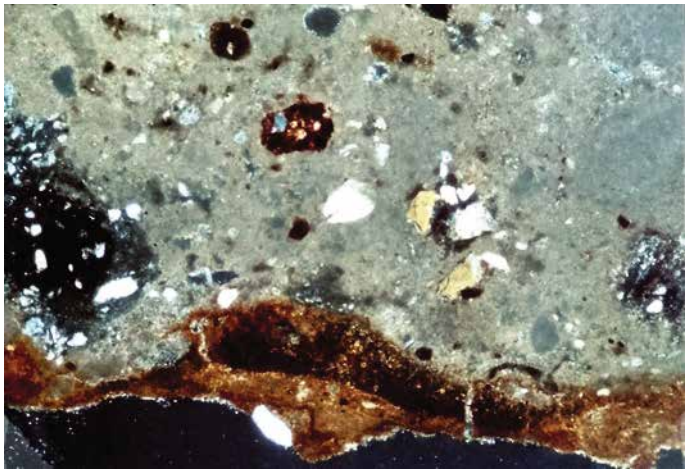


Fig. 8. Carbonated lime petrofabric of sample from the grave, with porous aggregates rich in organic material and upper clayey calcareous lime lining. Width of frame 2.4 mm.

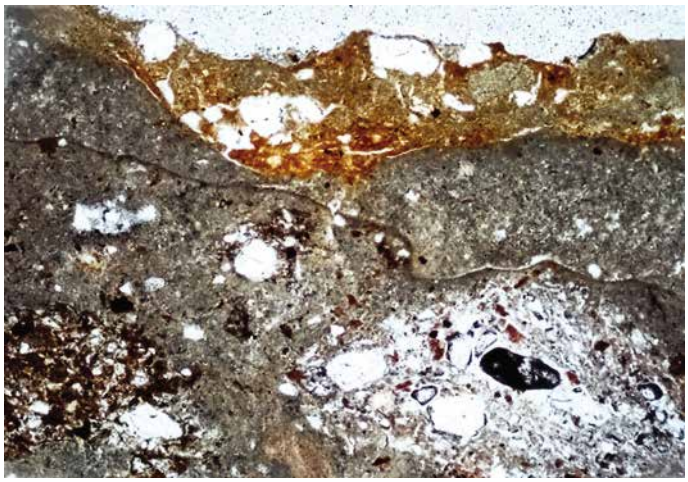


Fig. 9. Carbonated lime petrofabric of sample showing a lower thick fired clay lining. Width of frame 2.4 mm.

figures). The bulk layer of the mortar is composed of a very dense calcareous lime (Figs. 8, 9) with abundant crude aggregates of micritic fine-grained limestone or marl. Though it is difficult to determine accurately the portion of the limestone/marl aggregates, it is tentatively estimated that they comprise c. 60% of the lime mortar. The porosity of the mortar is c. 10–15%; the walls of the pores are occasionally coated by secondary sparitic calcite. Fine sand and finely ground grog make up less than 10% of the mortar. A charcoal

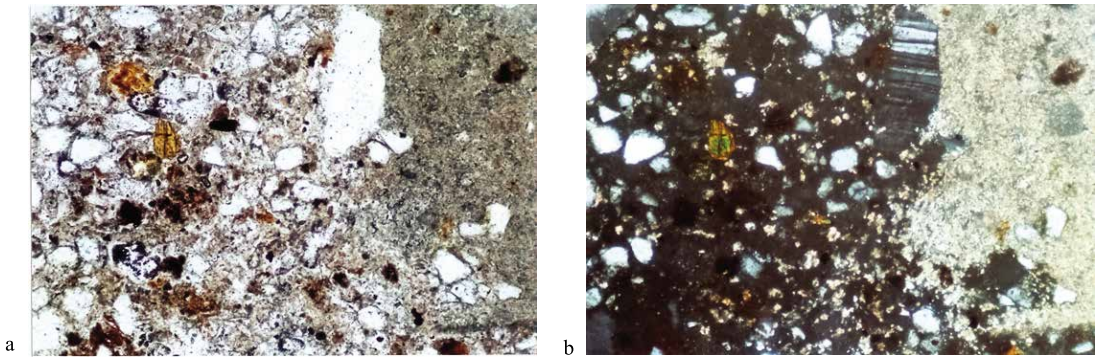


Fig. 10. Petrofabric of sandy/silt sherd with amorphous clay (left) embedded in the dense lime mortar (right) of sample: (a) Plane Polarized Light; (b) Cross-Polarized Light; note some biotite fine sand grains, normally abundant in Nile marls and very rare in Levantine sandy samples; the best preserved grain is the middle (brown in PPL and showing characteristic second order birefringence in Cross-Polarized Light). Width of frame 0.97 mm.

fragment was found in one of the pores. A peculiar petrographic component is vitrified ceramic fragments of c. 1 mm in size, which are composed of organic-matter-rich soil clay with numerous sand/silt particles. One such aggregate (Fig. 10) was found to contain biotite grains along with quartz and feldspars of silty/sandy composition, which may indicate that its origin is from Nile marl.

It can therefore be concluded that the plastered floor of the cist grave comprises densely packed lime mortar with finely ground grog, silicate grains of silt/sand and few charcoal fragments. The lime mortar at Tel Qana was probably prepared similarly to the Tel Lakhish plasters (Shimron 2004) by burning crushed calcareous rocks (soft limestone and marl) in a kiln at a temperature of about 800°C. On heating, rocks were calcinated to lime (CaO), which, upon slaking and exposure to air, turns eventually into calcite ($CaCO_3$). An addition of crushed ceramic sherds (grog) into the paste was probably aimed at obtaining the stronger, waterproof final product. The presence of waterproof hydraulic plasters was also confirmed by Regev et al. (2010) who examined in depth the plasters in Bronze Age Tell es-Safi/Gath. At Tel Qana, the grave plastering also included the burnishing of the surface by a mud-lime mixture of both the bedrock and the plaster surface. Posterior calcite precipitation in pores and fissures has not significantly impacted the original plaster fabric.

It is worth noting that, at present, the question of the first appearance of hydraulic lime mortars is yet controversial. Many archaeologists are of the opinion that hydraulic mortars were invented in late antiquity (described, e.g., by Vitruvius). The author (Tsatskin 1999) provided detailed descriptions of different types of hydraulic mortars in Roman–Byzantine buildings in Caesarea; however, the growing new information on the plasters of the Bronze Age may suggest that the knowledge of waterproof plasters of augmented strength may have been known in much earlier periods.

CONCLUSIONS

Although Tel Qana has been surveyed and surface-sampled in the past, the current excavation near its eastern fringes revealed, for the first time, an MB II occupation horizon and *in situ* finds dating to LB II and possibly to Iron Age II. The MB II layer reached in the squares was, however, void of structural remains and other features, and the (possibly) Iron Age winepresses are isolated features without any further context (for a description, see van den Brink 2007).

The unusually large LB II cist burial was cut into sterile *ḥamra* soil and contained the remains of a primary burial of a 20–25 year old individual interred with a number of ceramic and metal funerary burial gifts. This burial was uniquely plastered with thick layers of high quality, almost concrete-like, waterproof white lime plaster, probably produced similarly to plaster found in Bronze Age layers at Tel Lakhish. As the burial had most likely been opened in the past, its funerary assemblage does not necessarily reflect the original situation at the time of interment, and must be considered incomplete.

The ceramic vessels all appear to be of local production and date to a late phase in LB II. The metal objects, produced of a typical tin bronze, fit very well with the overall archaeometallurgical picture of the period as known to date. Minute traces of arsenic present in three blade weapons are reminiscent of older, Middle Bronze Age traditions, indicating that at least part of the metal used for these items might have derived from older, scrapped objects.

The predominant practice in Late Bronze Age Canaan was multiple interments in burial caves that were reused over long time spans. This prevailed in the preceding Middle Bronze Age as well (Gonen 1992b:240), and collective burial caves can be traced back even further, to the Early Bronze Age and Chalcolithic period. In the coastal plain and in the inland valleys, however, these were gradually abandoned and replaced with rectangular pit burials, which became the norm. As in the present case, these were often cist graves lined with stone slabs.

Tomb 5 in the cemetery of Tell Abu Hawam near Haifa is similar in construction and in orientation to the one in Tel Qana and only slightly smaller. It, too, was lined with thin limestone slabs, and it was found covered with five *in situ* stone caps (Anati 1959:93–94, Fig. 2: center, No. 5). Other comparisons are several cist graves in the northern cemetery near Kibbutz Palmaḥim (Gonen 1992a:90–93; Gophna 1993; Yannai et al. 2013). Though cist graves could contain up to three individuals, it seems that more often they contained a single burial, as in the present case. The shift from multiple cave burials to single pit interments in the coastal plain and inland valleys has been ascribed to the influence of Egyptian mortuary practices on the local funerary customs, following an intensive period of Egyptian hegemony over Canaan (Gonen 1992b:241). In this respect, the proximity of Tel Qana to Tel Afeq, the seat of an Egyptian governor (e.g., Beck and Kochavi 1993:68), comes to mind.

The relatively large size of the grave in comparison to the actual human interment and its carefully plastered walls and floor, a unique feature in the period, may indicate the status of the deceased. The east–west orientation could reflect Egyptian influence on mortuary behavior, though no Egyptian artifacts were found in this burial. The constraints of the salvage excavation prevented us from probing the immediate vicinity of the cist grave. Thus, though LB II pit burials often occur in groups (e.g., at Tell el-ʻAjjul, Palmaḥim and Tell Abu Hawam), whether the Tel Qana burial represents an isolated (and rather sophisticated) instance or part of a larger burial ground remains an open question.

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